

# CUWiN: The Open Source, Open Architecture, Open Spectrum Trifecta.

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*Available Online: <http://www.saschameinrath.com/pubs>*

# Overview

- What are Community Wireless Networks?
- How do these technologies work and what are the different wireless options available?
- Mesh CWN example – CUWiN.
- What are the social/community benefits?
- 7 smart alternatives.
- 4 take home messages.
- 3 conclusions. and where to get more information.
- But first (literally)...

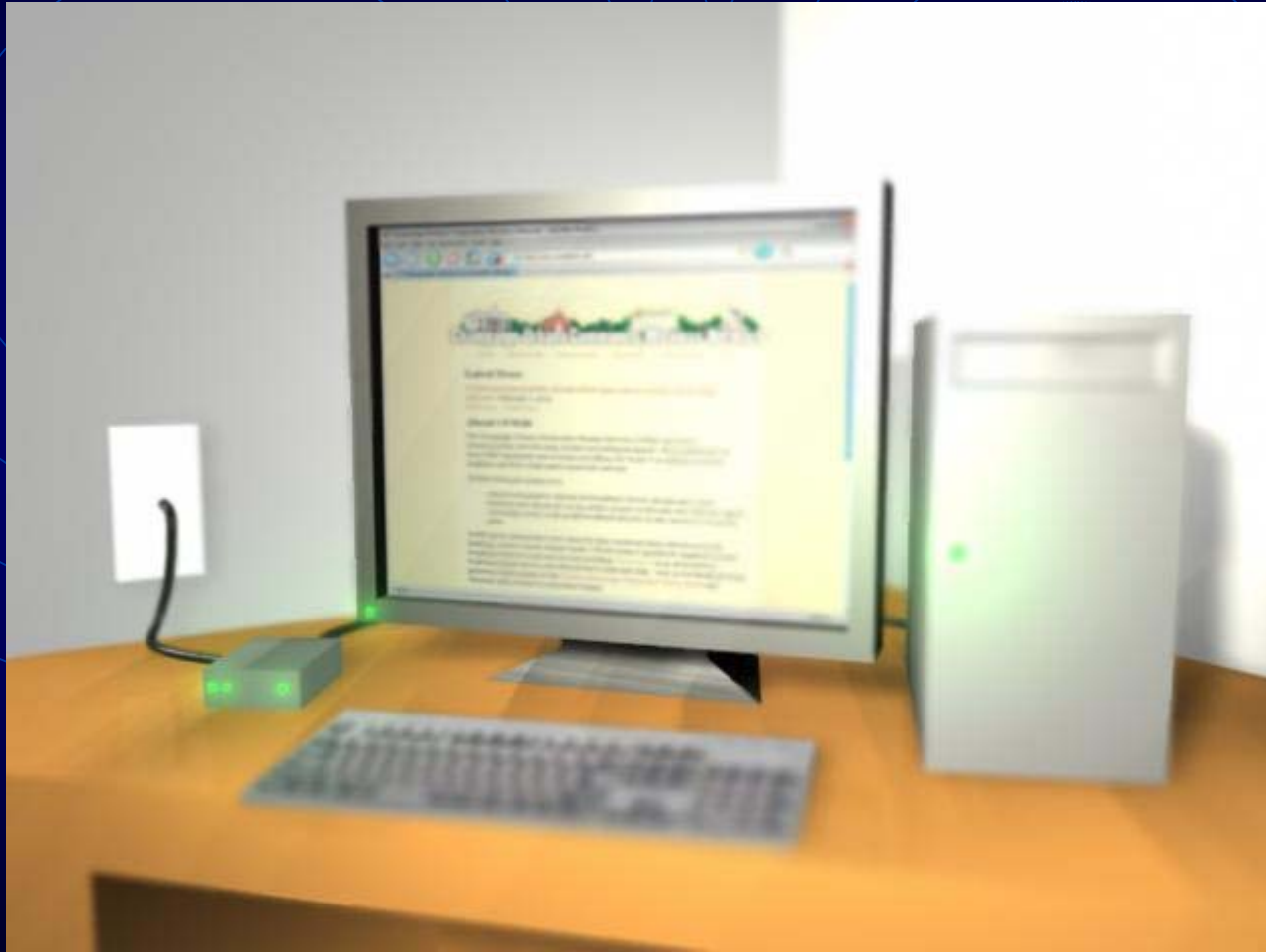
# Community Media Historically

- 1700s – Newspapers
- 1840s – Telegraph
- 1900s – Telephone
- 1920s – Radio
- Post WWII – Television/Public Access TV
- Today – Broadband (Internet) Connectivity

# Community Wireless Networks

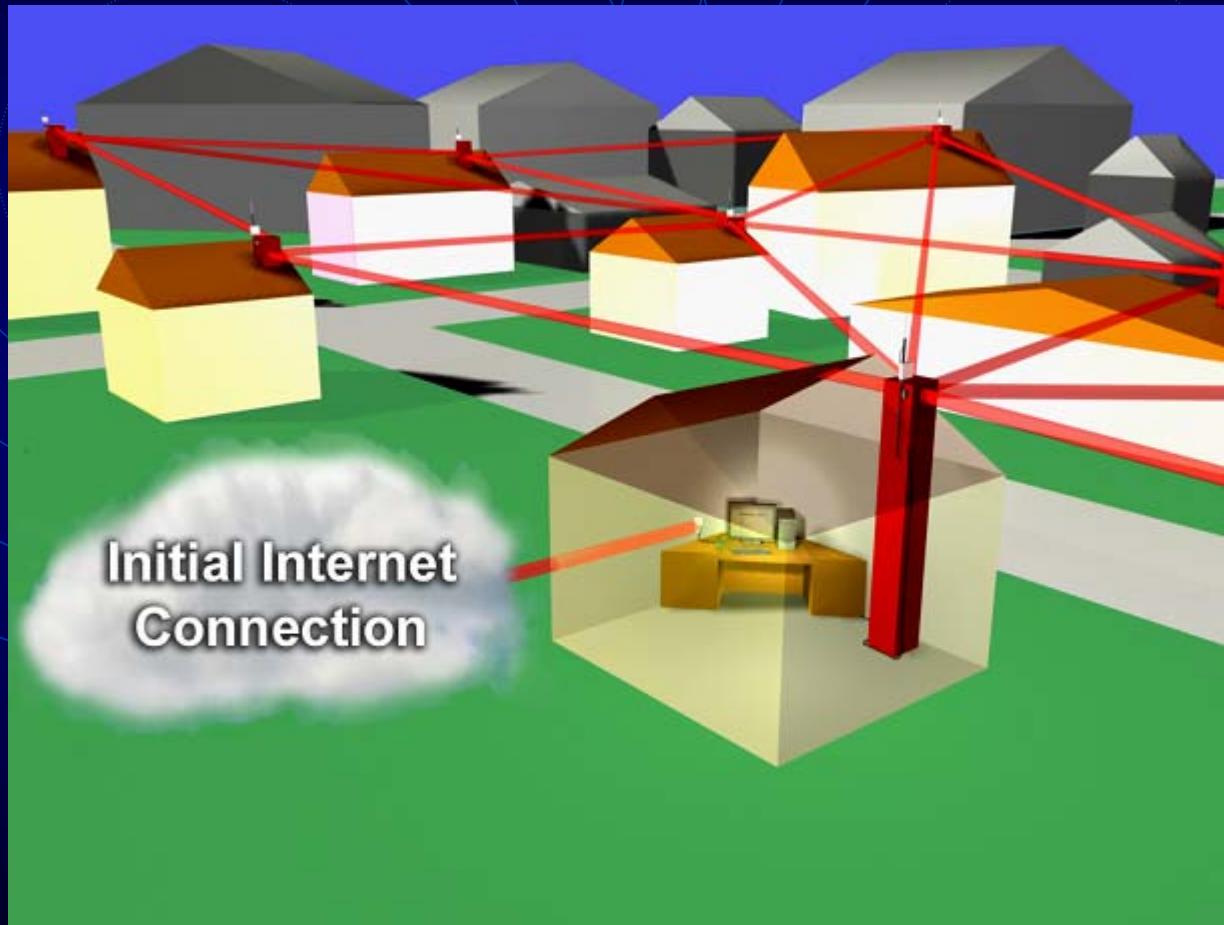
- Small & locally-based.
- Often non-profit, unincorporated, municipally supported, hybrid partnerships.
- Usually utilize off-the-shelf hardware.
- Mission to support both social & economic development.

# Home Network



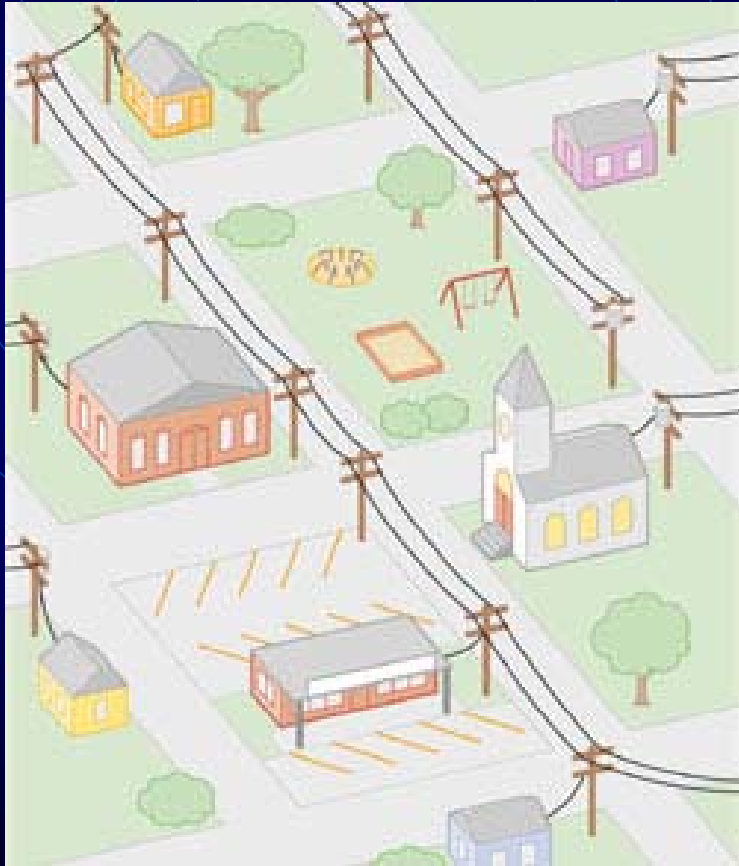
Graphic Credit: Pat Bergschneider

# Community Network



Graphic Credit: Pat Bergschneider

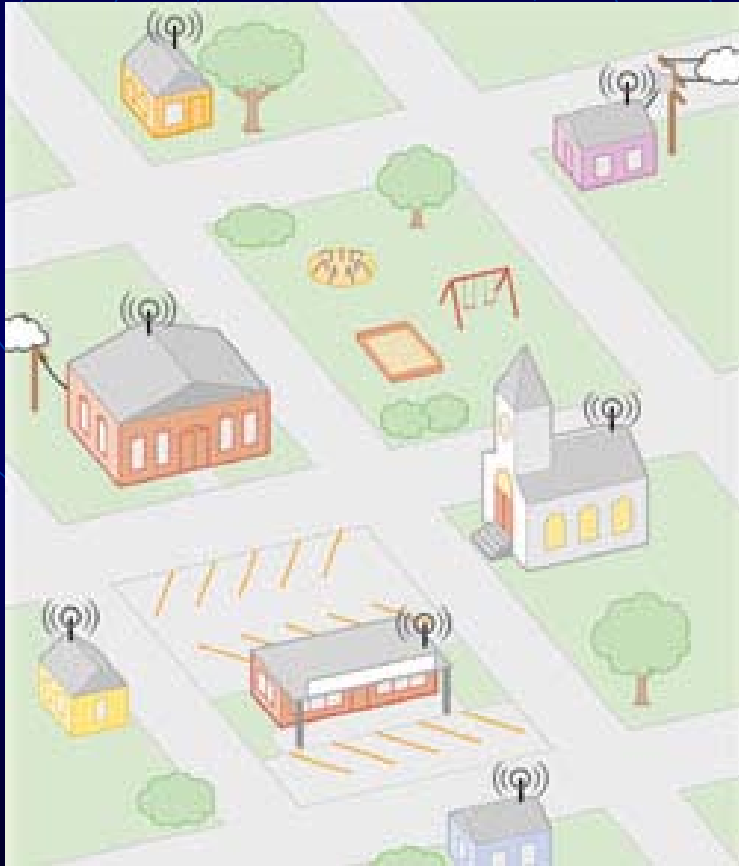
# Wired Networks



Graphic Credit: Darrin Drda

- 1840s technology
- Expensive
- Disruptive
- “Entrenched”

# Wireless Networks

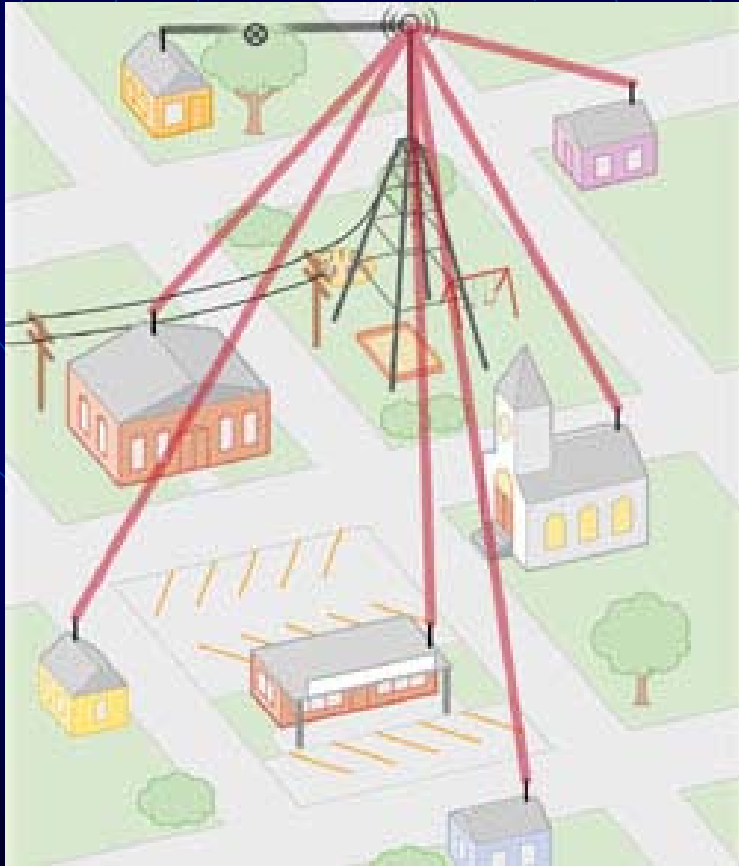


Graphic Credit: Darrin Drda

- Cheap!
- Non-invasive
- Mobile/Portable
- Ubiquitous
- Quick & Easy



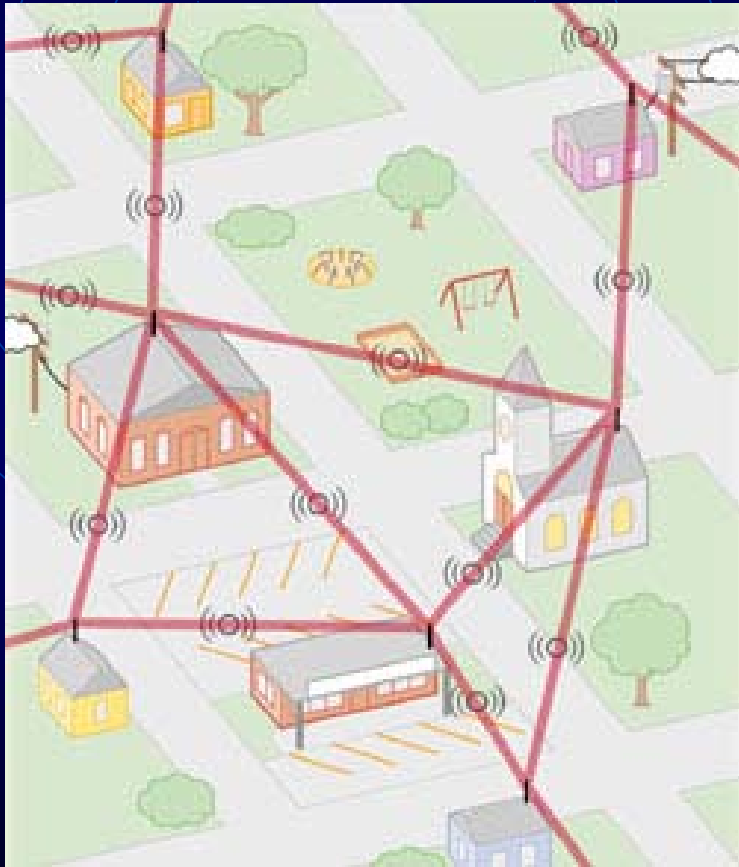
# Hub & Spoke Networks



Graphic Credit: Darrin Drda

- Centralized
- Relatively expensive
- Bandwidth-intensive
- High-power
- Single point-of-failure
- Slower than P2P/Mesh
- BUT, allow one to charge for all traffic

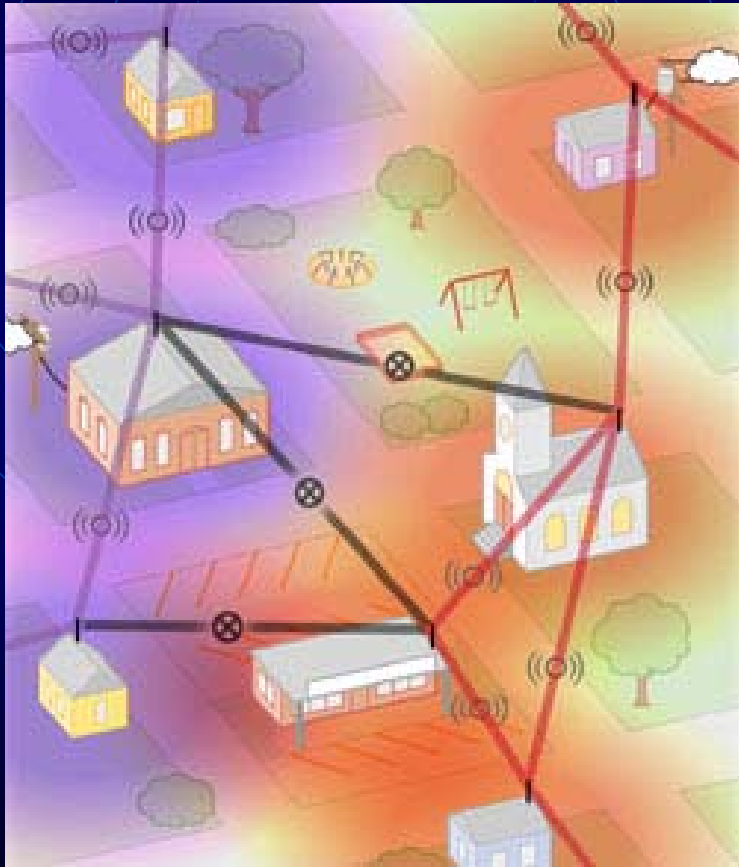
# Mesh Networks



Graphic Credit: Darrin Drda

- Decentralized
- By-passes obstacles
- Relatively cheap
- Low-power
- Very fast

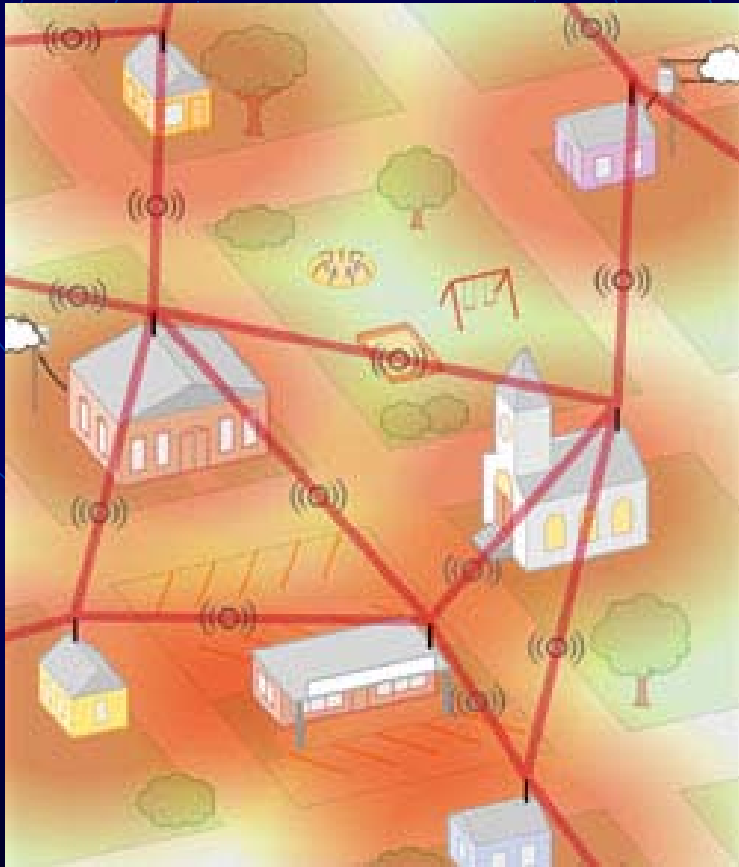
# Closed Networks



Graphic Credit: Darrin Drda

- Proprietary
- Expensive software
- Immature technology
- Factionalizes communities

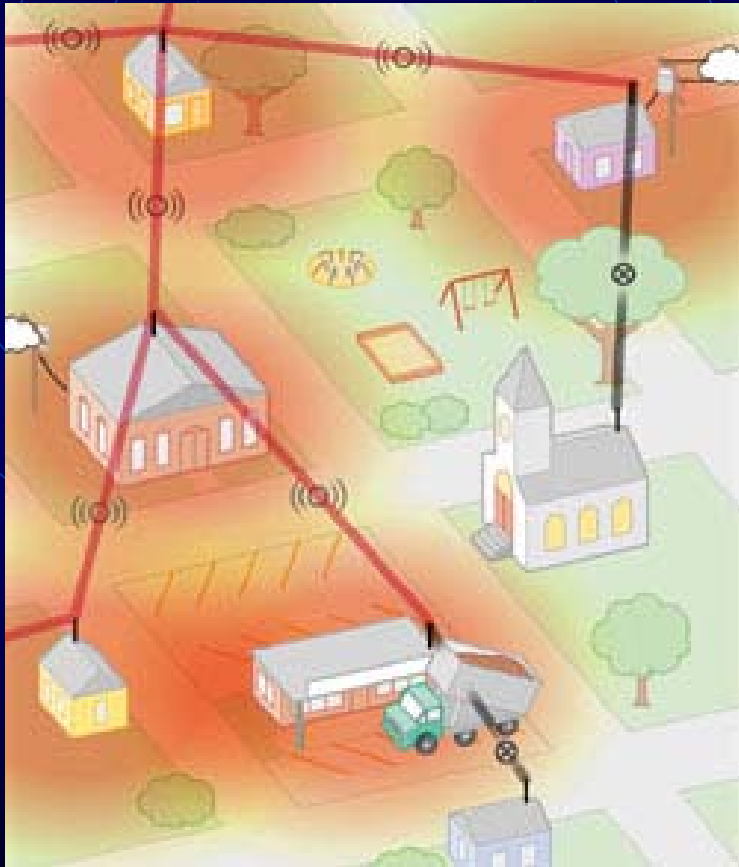
# Open Networks



Graphic Credit: Darrin Drda

- More secure
- Cheap/free software
- Open source
- Allows community resources on the network

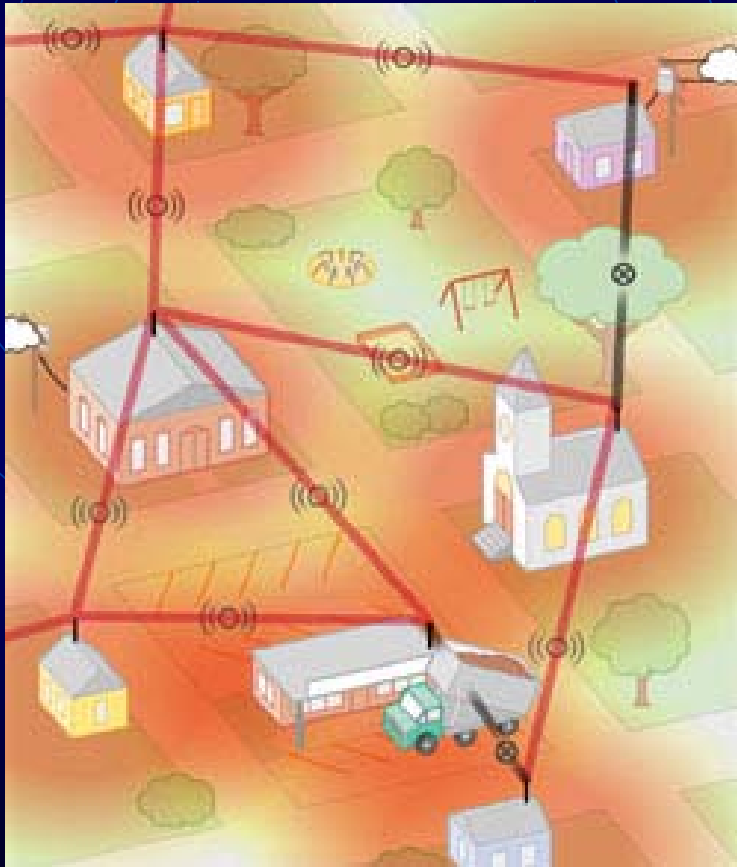
# Static Networks



Graphic Credit: Darrin Drda

- Fragile
- Non-scalable
- Time-intensive

# Dynamic Networks



Graphic Credit: Darrin Drda

- Robust
- Scalable
- Adaptable

# CUWiN's 4-Part Mission

- **Connectivity:**
  - Provide Internet connectivity to network users.
- **Development:**
  - Research and program software and build prototype hardware for use by other wireless projects throughout the US and around the globe.
- **Dissemination:**
  - Distribute open-source software and hardware specs to interested people and organizations.
- **Implementation:**
  - Build and support sustainable, not-for-profit communications networks in communities throughout the world.

# Inside CUWiN

- **Open Source:**

- NetBSD-based.
- Hazy Sighted Link State (HSLS) routing protocol – first documented by BBN Technologies – scalable routing.
- Expected Transmission Count (ETX) route prioritization – first developed by MIT – so-called “self-healing.”

- **Open Architecture:**

- x86-based devices (old PCs to single-board computers).
- “Off-the-shelf” components (antennas, WAPs, etc.).

- **Open Spectrum:**

- 802.11b/g (2.4 GHz)
- 802.11a (5 GHz)



# Pringles Can Antenna



- Cheap
- Labor-Intensive
- Decidedly not weatherproof

Photo Credit: Hope Hall

# Recycled Computer Node



Photo Credit: Hope Hall

# Ammo-Can Router

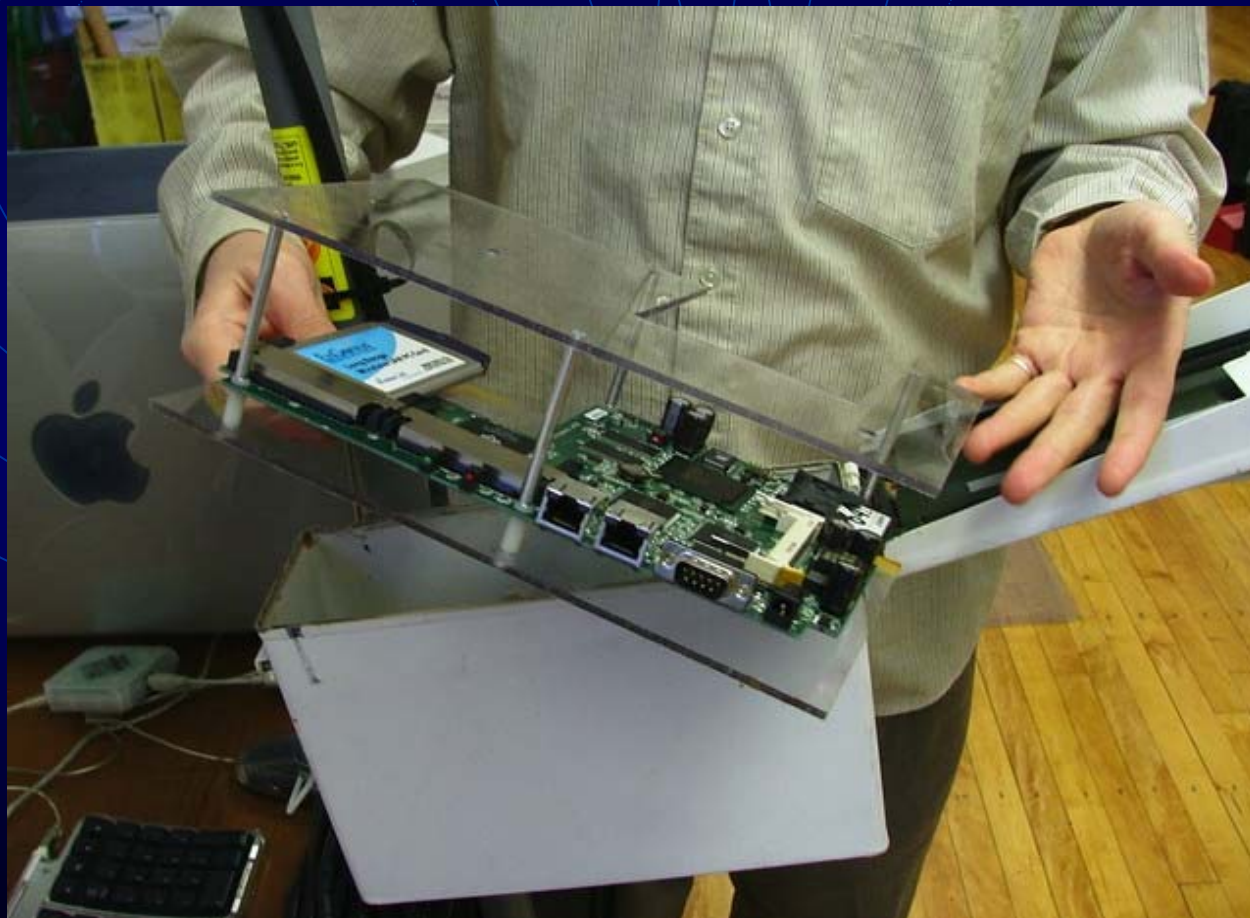


Photo Credit: Hope Hall



# Metrix Node



Photo Credit: Hope Hall

# Ready-to-Install Wireless Nodes



Photo Credit: Hope Hall

- Standardized
- Quick-to-Install
- Weather-Proof
- Small

# Rooftop Installation



- Quick & Easy
- Non-invasive
- Sometimes Scary

Photo Credit: Hope Hall

# “Software Proving Ground” I



Photo Credit: Hope Hall



# “Software Proving Ground” II



Photo Credit: CSIR, South Africa

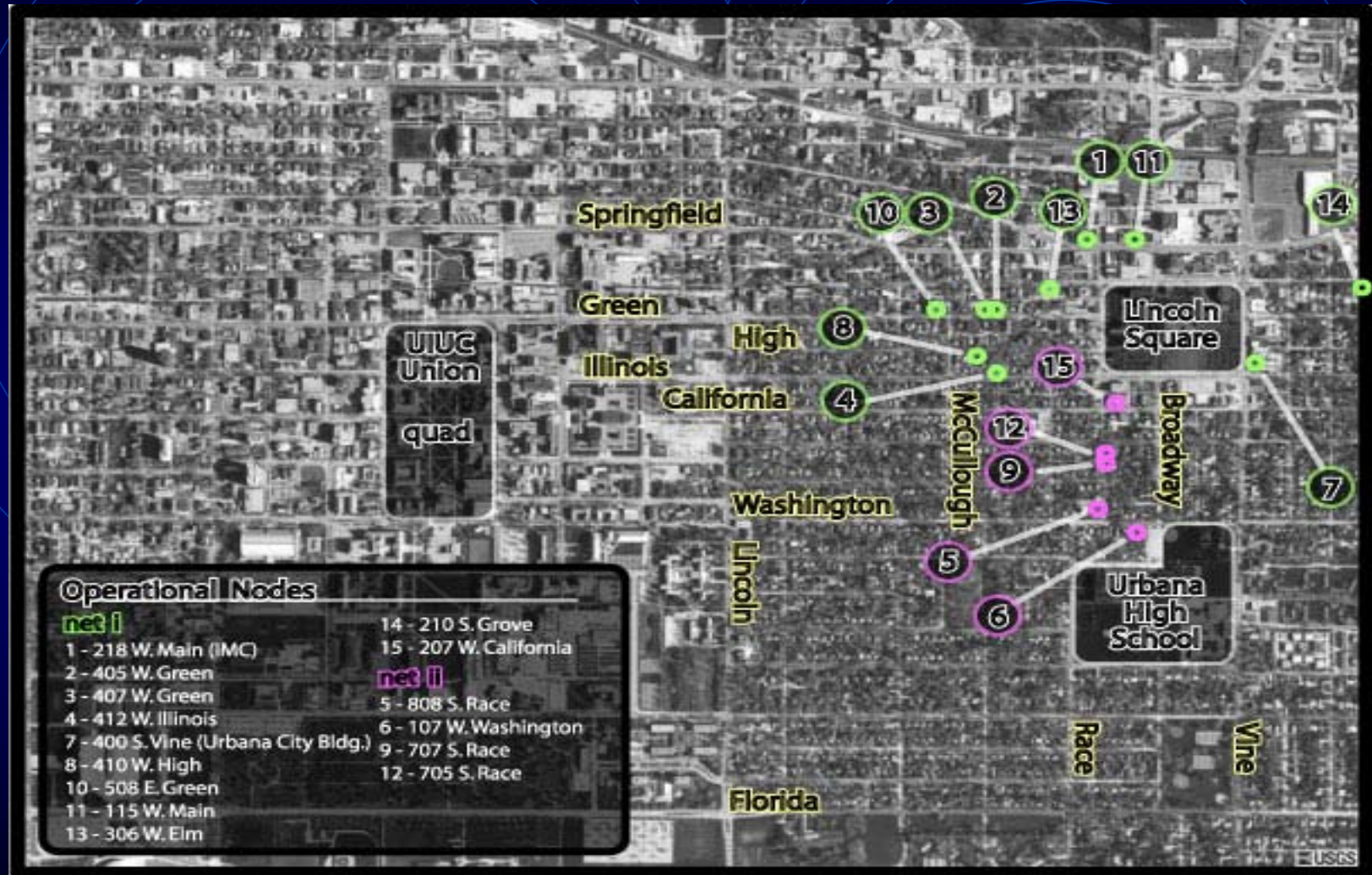


# Chambana.net Infrastructure



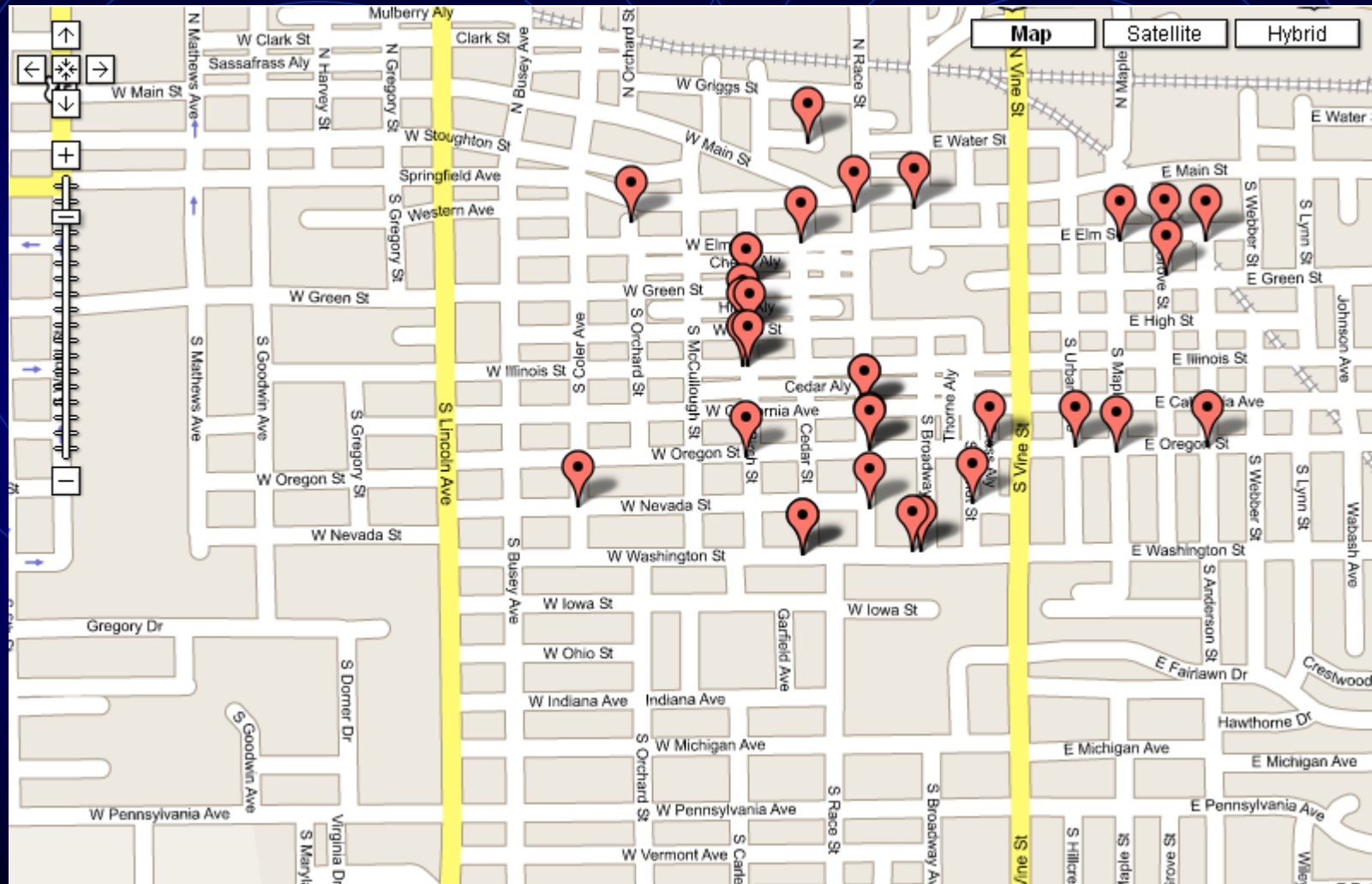
Photo Credit: Hope Hall

# CUWiN Network (Sept. 2004)



Graphic Credit: Paul King

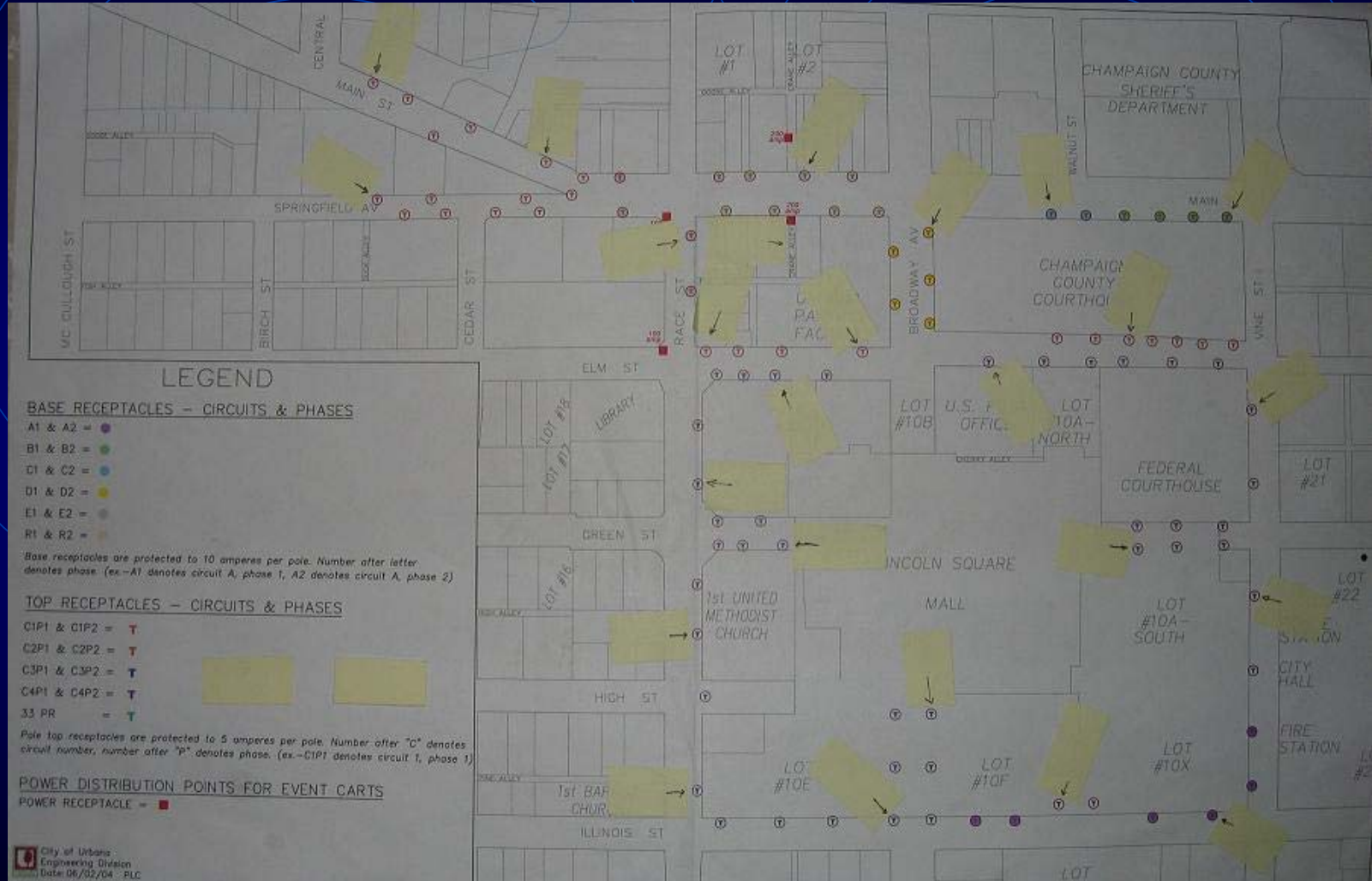
# CUWiN Network (July 2005)



Graphic Credit: Sean Fioritto



# Downtown Urbana Wireless Plan



# Social Benefits

- **The general public has the opportunity to be media producers** – broadcasting Internet radio, self-publishing journalism, displaying art projects, etc.
- **Universities, colleges, and K-12 classrooms can cheaply establish wireless networks** – creating tremendous infrastructure and maintenance savings versus wired networks.
- **Health-care providers can transfer information** to patients with limited mobility as well as exchange patient information among doctors, clinics, pharmacies, and hospitals.
- Wireless networks **facilitate e-government** initiatives such as online voter registration, directions to polling stations, bill payment, access to tax advice, and public service announcements.
- Wireless infrastructures offer **job creation opportunities** as businesses take advantage of lower barriers to market entry and the advantages of high-speed, low-cost communications.

# 7 Smarter Alternatives

- Share bandwidth – buy bulk wholesale.
- Distribute information storage.
- Integrate community intranet services.
- Foster mobile uploading & universal access.
- Support anonymous usage and downloading.
- Create immediate community-wide broadcasting opportunities.
- Open Source, Open Architecture, Open Spectrum Solutions.

# 4 Take-Home Messages

- Implement more community wireless networks – the movement is already growing rapidly.
- Strengthen the coalition of community wireless network implementers, developers, and policy allies.
- Repeal anti-competitive laws that limit consumer choices.
- Pass new regulations to support technological innovation and increase public access to the public airwaves.

# 3 Conclusions

- Community Wireless Networks offer more (and faster) services to end users at cheaper prices.
- Community Wireless Networks are a viable, accessible technological alternative.
- Like the Internet itself, Community Wireless Networks create new media production and information dissemination opportunities limited only by our own imaginations.



# For More Information:

The Champaign-Urbana Community Wireless Network,  
Free Press, and Prairienet Community Network present

*Making the Connection*

**The 2004 National Summit for  
Community Wireless Networks**

University of Illinois at Urbana-Champaign  
August 20-22, 2004

[www.communitywirelesssummit.org](http://www.communitywirelesssummit.org)

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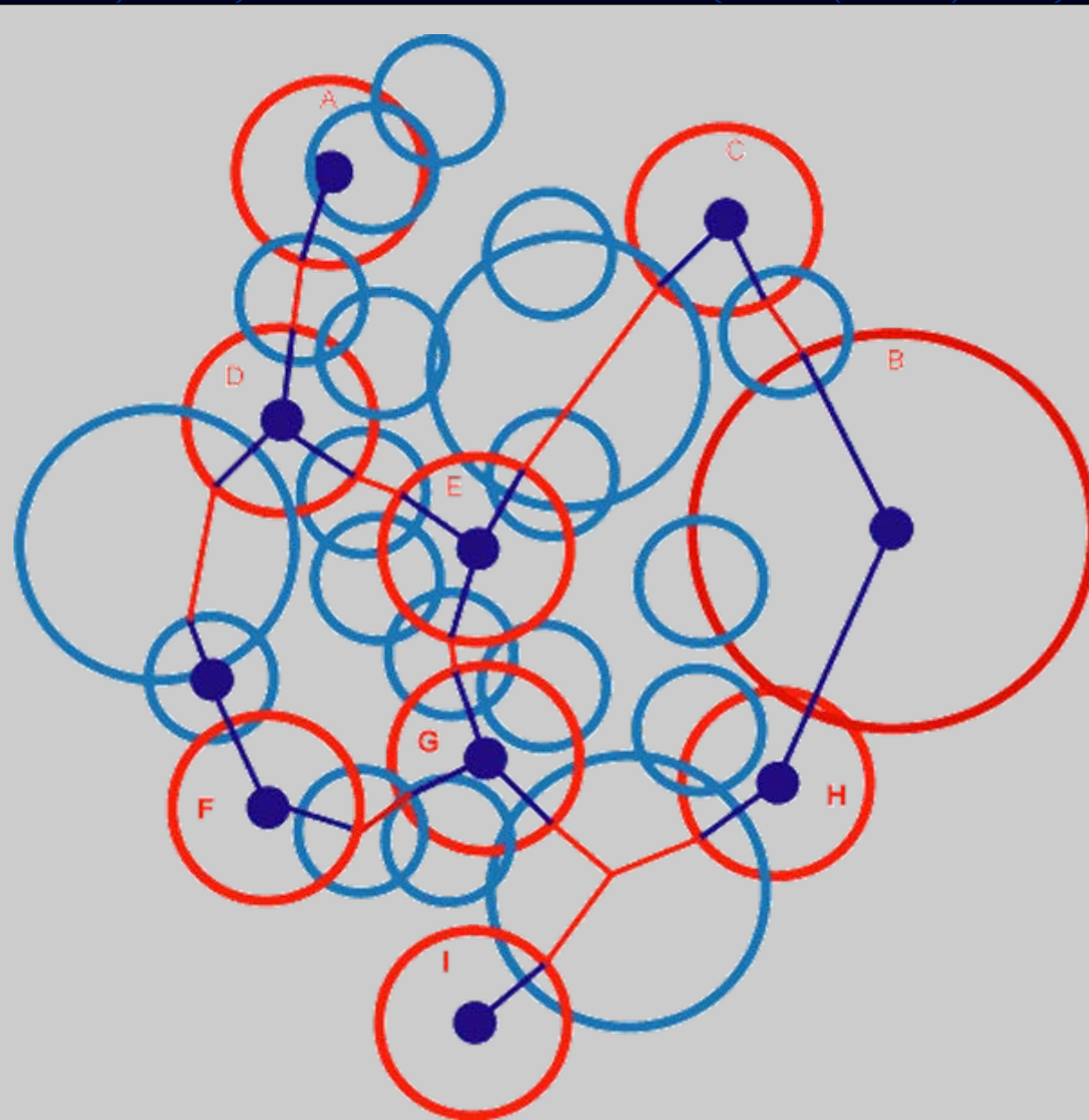
*[www.cuwireless.net](http://www.cuwireless.net)*

*[www.freepress.net/communityinternet](http://www.freepress.net/communityinternet)*

*[www.communityinternet.us](http://www.communityinternet.us)*

*Presentation available online at: <http://www.saschameinrath.com/pubs>*

# “Other People's Networks” (OPeN)



Blue circles = standard consumer WAP

Red circles = CWN w/ OPeN enhancement

Purple details are links created across blue WAPs

Red (CWN) nodes act as clients. Blue nodes only used for layer 2 transport

In this example a route is created over OPN from [A-D] [D-E] [E-C] etc. that by traditional methods would not be possible